Last Updated: December 2023

Experimental Methods in Agricultural and Food Sciences
Course Number: AGRI 2400
Faculty of Agricultural and Food Sciences

Academic Session: Winter 2024
Credit Hours: 3
Prerequisites: AGRI 1600 or HNSC 1200 or HNSC 1210 or the former AGRI 1500

Location:
Lecture: Room 172 Agriculture Building
Lab: Online via Zoom

Meeting Days and Class Hours:
Lecture: MWF 8:30 – 9:20 AM
Lab: RF 2:30 – 5:25 PM, R 5:45 PM – 8:40 PM

Instructor Information

Name & Title:	Jordan Bannerman, Instructor, Department of Entomology
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Office Hours:	10:30 AM – 12:30 PM Monday and Wednesday In-person drop in + virtual availability

Course Description

Undergraduate Calendar Description
Experimental design and data analysis using examples relevant to agricultural, food and human nutritional sciences. Ethics in research; critical thinking in data analysis; quantitative data analysis methods; applications of statistical analyses. Prerequisite: AGRI 1600 or HNSC 1200 or HNSC 1210 or the former AGRI 1500.

Instructional Methods
In-person lectures and online laboratories using a combination of synchronous and asynchronous delivery. Lectures focus on core concepts: scientific method, ethics, experimental design, and data analysis. Labs promote hands-on learning using data relevant to agricultural, food and human nutritional sciences.

Course Objectives and Learning Outcomes

On completing this course, students should be able to

- implement the scientific method
- recognize the underlying principles of experimental design
- integrate ethical considerations into experimental design
- demonstrate the basic concepts of sampling
- apply critical thinking to quantitatively evaluate hypotheses
- design experiments to test scientific hypotheses
- formulate and perform appropriate statistical tests to evaluate hypotheses
- construct reports based on statistical analysis

Description of Examinations

***Lecture*:** There is one midterm exam, worth 20% and a cumulative final exam worth 30%. Both exams focus on course content delivered in the lecture portion of the course. Refer to the course schedule for the date of the midterm.

Description of Assignments

Labs 2 through 8 each include a mandatory assignment. Altogether, these assignments are worth 50% of your overall course grade. For further details please review the "Lab assignment general guidelines" document on the course page.

Grade Evaluation

Midterm…….	20%
Final exam…….	30%
Lab Assignments……...	50%

Letter Grade Equivalency:

A+ = >90%; A=80-89%; B+ =75-79%; B=70-74%; C+=65-69%; C=60-64%; D=50-59%; F=<50%.

Important Dates

First day of course……	January 8, 2024
Mid Term Break……	February 19 – 23, 2024
Voluntary withdrawal date…….	March 20, 2024
Final day of course…….…….……	April 10, 2024
Exam period…….	April 12 – April 26, 2024

Texts, Readings, Materials

Required Texts: There are no required textbooks for this course.

Optional Texts:

- McKillup, S. 2010. **Statistics explained**. 2nd ed. Cambridge University Press. Cambridge, UK. 403 pp.
  - Easy to understand coverage of most course topics but lacks sufficient depth for some.
  - Very conceptual in nature, taking a limited-math approach to most topics.
  - Best resource to understand why we are following the procedures we discuss.
  - Agriculture-based examples for some topics.
- Gotelli, N.J., and Ellison, A.M. 2013. **A primer of ecological statistics**. 2nd ed. Sinauer Associates, Inc. Publishers. Sunderland, MA. USA. 614 pp.
  - My favorite book for the topics covered in this course.
  - Coverage of some topics more advanced than ideal for a student's first experimental methods course.
  - Includes coverage of many topics not covered by this course.
  - Few agriculture-based examples.
- There are many other statistics books for life scientists that are suitable for this course. Look to ensure the book covers the scientific method, experimental design, probability, ANOVA, and regression at minimum. If you are considering purchasing a textbook and want my opinion, please email me to discuss it.

Course Philosophy and Policies

Students' Learning Responsibilities

Students should approach this course with academic integrity, take responsibility for their actions and honor their academic commitments. Regular attendance to lectures and labs is essential for success in this course. Students are encouraged to ask for assistance whenever they feel it is necessary. Students should treat their fellow students with respect and foster a cooperative learning environment where other's ideas are heard and discussed.

How this course fits into the curriculum

This course is intended to provide the requisite experimental design and applied statistical background for students in all degree programs in the Faculty of Agricultural and Food Sciences. Students would typically take this in Fall or Winter Term of their second year. This course is a pre-requisite for ABIZ 3120 (Commodity Futures Markets), ABIZ (3080 Introduction to Econometrics), ABIZ 3540 (Financial Risk Management), FOOD 4510/HNSC 4280 (Food Product Development), HNSC 2000 (Research Methods and Presentation), HNSC 3260 (Food Quality Evaluation), HNSC 4270 (Sensory Evaluation of Food), HNSC 4290 (Food Nutrition and Health Policies). This course is a pre- or co-requisite for ABIZ 2520 (Introduction to Management Sciences).

Inquiries to Instructor

Students are encouraged to contact their instructor in-person, by e-mail, or by phone whenever assistance is required. You are required to obtain and use your U of M email account for all communication between yourself and the university.

UM Learn (UM Learn portal)

Course materials (i.e. lecture notes and lab materials) will be uploaded to UM Learn, it is your responsibility to learn how to access this page. You will also be expected to upload assignments to this page.

Late or Missed Assignments

Penalties for late submission of assignments are 10% of the maximum grade per day late. For assignments submitted electronically, the timestamp/date when the e-mail is received into my inbox, or the assignment is uploaded to UM Learn, will be used as the assignment submission date. Assignments submitted ten or more days late will receive a mark of zero.

When an assignment is missed due to an extenuating circumstance (See: **temporary student absence form** and **policy**), or with prior written approval from the course instructor, a new due date for the assignment must be arranged by contacting the instructor. False declarations on the temporary student absence form are considered a breach of academic integrity and can result in discipline. Further documentation may be requested for absences/study disruptions of longer than 3 days and in cases in which a student has made multiple requests for temporary absences.

Missed midterm exam

When a midterm exam is missed due to an extenuating circumstance (See: **temporary student absence form** and **policy**), or with prior written approval from the course instructor, the marks allocated for the midterm exam will re-allocated to the final exam. False declarations on the temporary student absence form are considered a breach of academic integrity and can result in discipline.

Recording of Classes

All synchronous online lab sessions will be recorded and posted. Jordan Bannerman holds copyright over the course materials, presentations and lectures which form part of this course. No additional audio or video recording of lectures or presentations is allowed in any format without Jordan Bannerman's permission. Course materials, both paper and digital, are for the participant's private study and research only, and are not to be distributed to others.

Academic Integrity

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious **academic discipline**. Cheating on examinations or tests may take the form of copying from another student or using unauthorized materials during an exam. Academic misconduct on exams and assignments can also include unauthorized use of artificial intelligence bots/language learning models, impersonation, duplicate submission, and inappropriate collaboration. A student found guilty of contributing to cheating in examinations or assignments is also subject to serious academic discipline. Electronic detection tools may be used to screen assignments in cases of suspected academic misconduct. False declarations on the temporary student absence form are also considered a breach of academic integrity and can result in discipline. Students should acquaint themselves with the University's academic integrity policies at **http://umanitoba.ca/student-supports/academic-supports/academic-integrity**

Course schedule, Winter 2024

Week	Date	Tentative Lecture Topic	Lab topic
1	Jan 8	Course introduction, why scientists need statistics	No Lab
	Jan 10	Scientific method	
	Jan 12	Data and study types	
2	Jan 15	Principles of experimental design	Lab 1 – Software introduction
	Jan 17	Principles of experimental design	
	Jan 19	Principles of experimental design	
3	Jan 22	Research ethics	Lab 2 – Experimental design
	Jan 24	Research ethics	
	Jan 26	Visualization	
4	Jan 29	Probability to aid decision making	Lab 3 – Data visualization
	Jan 31	A simple statistical analysis using chi-square	
	Feb 2	Distributions of random variables	
5	Feb 5	The normal distribution	No lab
	Feb 7	Using samples to infer characteristics of a population	
	Feb 9	Using samples to infer characteristics of a population	
6	Feb 12	Tests for comparing means of one and two samples	Lab 4 – Summary statistics
	Feb 14	Tests for comparing means of one and two samples	
	Feb 16	Tests for comparing means of one and two samples	
7	Feb 19	Winter term break	No lab
	Feb 21		
	Feb 23		
8	Feb 26	Midterm	Lab 5 – *t* tests
	Feb 28	Single-factor analysis of variance	
	Mar 1	Single-factor analysis of variance	
9	Mar 4	Single-factor analysis of variance	Lab 6 – Analysis of variance 1
	Mar 6	Multiple comparisons for analysis of variance	
	Mar 8	Error and power	
10	Mar 11	Biological significance	No lab
	Mar 13	RCB analysis of variance	
	Mar 15	RCB analysis of variance	
11	Mar 18	Two-factor analysis of variance	Lab 7 – Analysis of variance 2
	Mar 20	Two-factor analysis of variance	
	Mar 22	Split plot and Latin square designs	
12	Mar 25	Linear regression and correlation	No Lab
	Mar 27	Linear regression and correlation	
	Mar 29	No lecture – Good Friday	
13	Apr 1	Linear regression and correlation	Lab 8 – Correlation and regression
	Apr 3	Chi-Square revisited	
	Apr 5	Other non-parametric tests	
14	Apr 8	Data collection	No lab
	Apr 10	Flex	